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Land Systems Inventory of the Medicine Bow Mountains and Sierra Madre, Medicine Bow National Forest, Wyoming¹



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Abstract

A "Land Systems Inventory" (LSI) was performed for the Medicine Bow Mountains and Sierra Madre in the Medicine Bow National Forest, Wyoming. The LSI is a terrain analysis procedure adopted by the USDA Forest Service to delineate relatively homogeneous mappable units of land whose distinct characteristics reflect differences in land capability for multiple resource management at various levels of planning. The LSI is hierarchical in the sense that mapping is done at different levels of detail, with resolution of mapped units tied to map scale. This allows the most appropriate level of classification to be utilized for any given planning task at the national, regional, forest, district, or project level. The LSI is integrative in the sense that it recognizes that the landscape functions differently as a whole than would have been predicted by adding up the individual effects of geology, landforms, vegetation, and soils. The landtype association level of classification was the most detailed level developed in this project. Landtype associations have proven to be the most widely used mapping units for resource management at the forest and district levels. A total of 26 landtype associations were identified.

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Richard A. Marston and David T. Clarendon

INTRODUCTION

The following report and accompanying maps describe a "Land Systems Inventory" (LSI) of the Medicine Bow Mountains and Sierra Madre within the Medicine Bow National Forest in Wyoming. The LSI is a system of land classification and mapping used to delineate relatively homogeneous units of land whose distinct characteristics reflect differences in land capability for multiple resource management at various levels of planning (Wendt et al. 1975, Berry and Maxwell 1981). The LSI approach to forest planning is based on two fundamental postulates:

- 1) "The capability of land to produce various natural resource oriented goods and services as well as its suitability for such production are critical elements in making sound land use decisions" (Miller 1981).
- 2) "Every spot on the earth's surface has a multitude of varied but intricately interrelated attributes which make it unique and difficult to compare with any other" (Mitchell 1975).

The impetus for land classification in the U.S. Forest Service can be traced to the Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976. The background, concepts, and structure of the LSI were originally described by Wertz and Arnold (1972) prior to this key legislation, but have evolved thereafter according to the physical geography and resource management concerns of each region in the U.S. Forest Service, and the philosophy and training of forest personnel. The principle advantages of utilizing the LSI as a tool in resource management are twofold (Miller 1981):

- 1) It is INTEGRATIVE in the sense that it recognizes that the landscape functions

differently as a whole than would have been predicted by adding up the individual elements of climate, geology, landforms, soils, and vegetation.

- 2) It is HIERARCHIAL in the sense that mapping is done at different levels of detail, with resolution of mapped units tied to map scale, so that the most appropriate level of classification can be utilized for any given planning task at the national, regional, forest, district, or project level.

The levels of classification and mapping in the LSI are summarized in Table 1. Experience with the LSI in the U.S. Forest Service has revealed that the landtype association level of classification is the most widely used level for resource management in forest and district planning. The LSI in the present report is described down to the landtype association level. In other LSI studies, mapping at a given level has been accomplished by sub-dividing mapped units at the next more general level. In still other LSI studies, mapping at a given level has been accomplished by combining mapped units from the next more detailed level.

To be accepted as an effective management tool, the classification and mapping scheme of the LSI must be internally consistent (reproducible) and externally adequate (recognizable). The former refers to the degree to which landscape properties can be exactly defined, necessary if one is to extend the classification from known to unknown areas. The latter refers to the degree to which mapped units are visible within the total mapped area using available tools and resources. It is noteworthy that the recognizability and reproducibility of the LSI are inversely related; the more carefully landscapes are defined, the more types that will result and the more difficult it will be to recognize each one.

Table 1.-Levels of classification and mapping in the LSI.

<u>Level^a</u>	<u>Mapping Criteria and Level of Application^b</u>	<u>Appropriate Map Scale^c</u>	<u>Mapping Unit Resolution^d</u>
Domain	Subcontinental areas of broad climatic similarity; mapped by Bailey (1976); used for national planning	< 1:4,000,000	1,000,000's square miles
Division	Subdivision of a domain determined by isolating areas of differing vegetation and regional climate; mapped by Bailey (1976); used for national planning	1:3,000,000 to 1:5,000,000	100,000's square miles
Province	Broad vegetation regions with the same type or types of zonal soils; mapped by Bailey (1976); used for national planning	1:2,000,000 to 1:4,000,000	10,000's square miles
Section	Climatic climax vegetation at the level of Kuchler's potential natural vegetation; mapped by Bailey (1976); used for regional planning	1:1,000,000 to 1:3,000,000	1,000's square miles
subsection	Part of a section having uniform landforms at the level of Hammond's (1964) land surface form regions (level IV landforms); used for forest planning	1:126,720 to 1:500,000	10's to 100's square miles
Landtype Association	Part of subsection mapped using order V landforms soil subgroups or soil families, level III or IV vegetation, geologic formation names; used for forest and district planning	1:63,360 to 1:126,720	1's to 10's square miles
Landtype	Part of a landtype association mapped using order IV landforms, soil families level IV vegetation, lithologic units; used for district planning	1:24,000 to 1:63,360	0.1's to 1's square miles
Landtype Phase	Part of a landtype mapped using order VI landforms soil families or soil series, level IV or V vegetation, stratigraphic or structural features of lithologic units used for project planning	1:15,840 to 1:24,000	0.01's to 0.1's square miles (6.4 to 64 acres)
Site	Part of a landtype phase mapped using order VII landforms, soil series or soil types, level IV vegetation, drill core data; used for project planning	> 1:15,840	0.001's to 0.01's square miles (0.64 to 6.4 acres)

^aLevels of classification based on Berry and Maxwell (1981) and the U.S. Forest Service (1980) Region 4 Land Systems Inventory Handbook

^bMapping criteria for the four highest levels of classification based on the U.S. Forest Service (1980) Region 4 Land Systems Inventory Handbook; mapping criteria (other than orders of landforms) for the five lower levels of classification based on the U.S. Forest Service (1982) Region 10 Land Systems Inventory Handbook; terminology regarding orders of landforms from Pitty (1982); see Table 3.

^cAppropriate map scale modified from Wendt et al. (1975) and the U.S. Forest Service (1982) Region 10 Land Systems Inventory Handbook.

^dMapping unit resolution based on Miller (1981) and the U.S. Forest Service (1980) Region 4 Land Systems Inventory Handbook.

GENERAL DESCRIPTION OF THE MEDICINE BOW MOUNTAINS AND SIERRA MADRE

Three prongs of the Southern Rocky Mountains Physiographic Province extend into Wyoming: the Laramie Range, Medicine Bow Mountains, and Sierra Madre (Blackstone 1988). The Laramie Range includes 179,000 acres of national forest land. However, this range is not covered by the Land Systems Inventory in the present report, nor is the Thunder Basin National Grassland, also part of the Medicine Bow National Forest. The Medicine Bow Mountains span 540,000 acres of which 519,000 acres are national forest land. The Sierra Madre span 365,000 acres of which 339,000 acres are national forest land. Land ownership is patchy in many places between the Medicine Bow National Forest, private, and state lands (Alexander et al. 1986).

The Medicine Bow Mountains are bordered on the east by the Laramie Basin, a structural basin containing rocks ranging in age from Paleozoic to recent. The Medicine Bow Mountains range in elevation from 8,000 to 11,000 feet, with the Snowy Range massif extending further upward to 12,013 feet. The Sierra Madre lack the broad upland surface of the Medicine Bow Mountains, ranging in elevation from 6,500 feet to 11,044 feet. The Sierra Madre are separated from the Medicine Bow Mountains by the Saratoga Valley, a narrow structural trough. Sierra Madre is the name applied in Wyoming to a continuous mountain mass in Colorado known as the Park Range. The crest of the Sierra Madre forms the Continental Divide. Rivers draining the west slope of the Sierra Madre are part of the Colorado River system by way of the Little Snake River. Drainage on the east slope is part of the Mississippi River System by way of the North Platte and Missouri Rivers (Blackstone 1988).

The north half of the Medicine Bow Mountains and Sierra Madre contains granite and gneiss older than 2.5 billion years, overlain by metamorphosed sedimentary rocks, quartzite and schist, that are about 2 billion years old. The highest part of the Medicine Bow Mountains, the Snowy Range, is composed of

these metasedimentary rocks, culminating in Medicine Bow Peak at an elevation of 12,013 feet. The southern half of both ranges contain much younger granite about 1.4 billion years old. Both ranges were uplifted during the Laramide orogeny, 50 to 60 million years ago (Lageson and Spearing 1988). Extensive evidence of Pleistocene glaciation is found in the northern half of the Medicine Bow Mountains in the form of ice sculpted peaks, till deposits, glacial striations, and deranged drainage.

The climate of the Medicine Bow Mountains and Sierra Madre is influenced by frontal systems and orographic storms in winter months. Summer storms are both orographic and convectional. Convectional storms are frequent in the summer, but their intensity is not usually as great as at lower elevations. Precipitation ranges from 32 inches at 8,000 feet elevation to 48 inches at 11,000 feet elevation. At lower elevations, about one-half of the precipitation falls in the form of snow during the months of April through September. At higher elevations, about three-fourths of the precipitation falls in the form of snow during the period October through May. Rainfall amounts for a 24-hour storm range from 1.12 inches for a one-year storm frequency to 3.4 inches for the 100-year event. Temperature ranges from a mean monthly value of 35°F. in January at 11,000 feet elevation to 61°F. in July at 8,000 feet. Extremes can range from -50°F. in the winter to 90°F. in the summer. The average length of the frost-free period is 90 days (June 5 to September 5) at lower elevations, but only a few frost-free days occur on some of the higher north-facing slopes. Prevailing winds are from the west, southwest and northwest, but the prevailing wind direction at peak wind speeds is usually from the northwest or west. Wind speeds may peak at over 100 mph and hold hourly averages as high as 60 mph (Marc Wilcox, personal communication).

The principal forest series in both ranges include subalpine fir (Abies lasiocarpa), Engelmann spruce (Picea engelmannii), lodgepole pine (Pinus contorta). In addition, fairly significant stands of aspen (Populus tremuloides) are found in the Sierra Madre

(Alexander et al. 1986). Lodgepole pine is the dominant species at lower elevations, but it also occurs in mixed stands with Engelmann spruce and subalpine fir. Spruce and subalpine fir occur mainly along the drainageways and at higher elevations. Kinnikinnick (Arctostaphylos uva-ursi), pinegrass (Calamagrostis rubescens, Vaccinium spp. and sedges (Carex spp.) are the major species in the understory. The spruce and fir at higher elevations is small and poorly stocked. The vegetation of the subalpine and alpine areas is grasses, forbs, wildflowers, small shrubs, and stunted species. At elevations below treeline, but still within the national forest, sagebrush (Artemisia tridentata) and grasses are mixed with deciduous shrubs and aspen.

CLASSIFICATION AND MAPPING PROCEDURES

The five most general levels of classification and mapping in the LSI have already been determined for the entire United States by Crowley (1967), Bailey (1976, 1983), Bailey and Cushwa (1981) and the U.S. Fish and Wildlife Service (1982). The five most general levels of classification are reproduced in Figures 1-2 as pertinent to the Medicine Bow National Forest. In summary:

Domain: "Dry Domain" (300 series)

Division: "Semi-Arid Steppe Regime
Highlands Division" (H310 series)

Province: "Rocky Mountain Forest Province"
(M311 series)

Section: "Ponderosa Pine-Douglas Fir Forest
Section" (M3113 series)

Subsections: "Plains with High Hills" with
50-80% of area gently sloping, 500-1000 feet
local relief, 50-75% of gentle slope is in
lowland (B4b)

"Open High Mountains" with 20-50% of area
gently sloping, 3000-5000 feet local relief,

more than 75% of gentle slope is in lowland
(C6a)

"High Mountains" with less than 20% of area
gently sloping, 3000-5000 feet local relief
(D6)

Three criteria are used for classification at the
subsection level: scale (upper case letter), local
relief (numerical), and profile type (lower case
letter).

SLOPE

- A = more than 80% of area gently sloping
- B = 50-80% of area gently sloping
- C = 20-50% of area gently sloping
- D = less than 20% of area gently sloping

LOCAL RELIEF

- 1 = 0-100 feet
- 2 = 100-300 feet
- 3 = 300-500 feet
- 4 = 500-1000 feet
- 5 = 1000-3000 feet
- 6 = 3000-5000 feet

PROFILE TYPE

- a = more than 75% of gentle slope is in
lowland
- b = 50-75% of gentle slope is in lowland
- c = 50-75% of gentle slope is on upland
- d = more than 75% of gentle slope is on
upland

When the criteria are combined, the resulting
landform can be described by the following
terminology (Hammond 1970):

PLAINS

- A1 = Flat plains
- A2 = Smooth plains
- B1 = Irregular plains, slight relief
- B2 = Irregular plains

TABLELANDS

- B3c, B3d = Tablelands, moderate relief
- B4c, B4d = Tablelands, considerable relief
- B5c, B5d = Tablelands, high relief
- B6c, B6d = Tablelands, very high relief

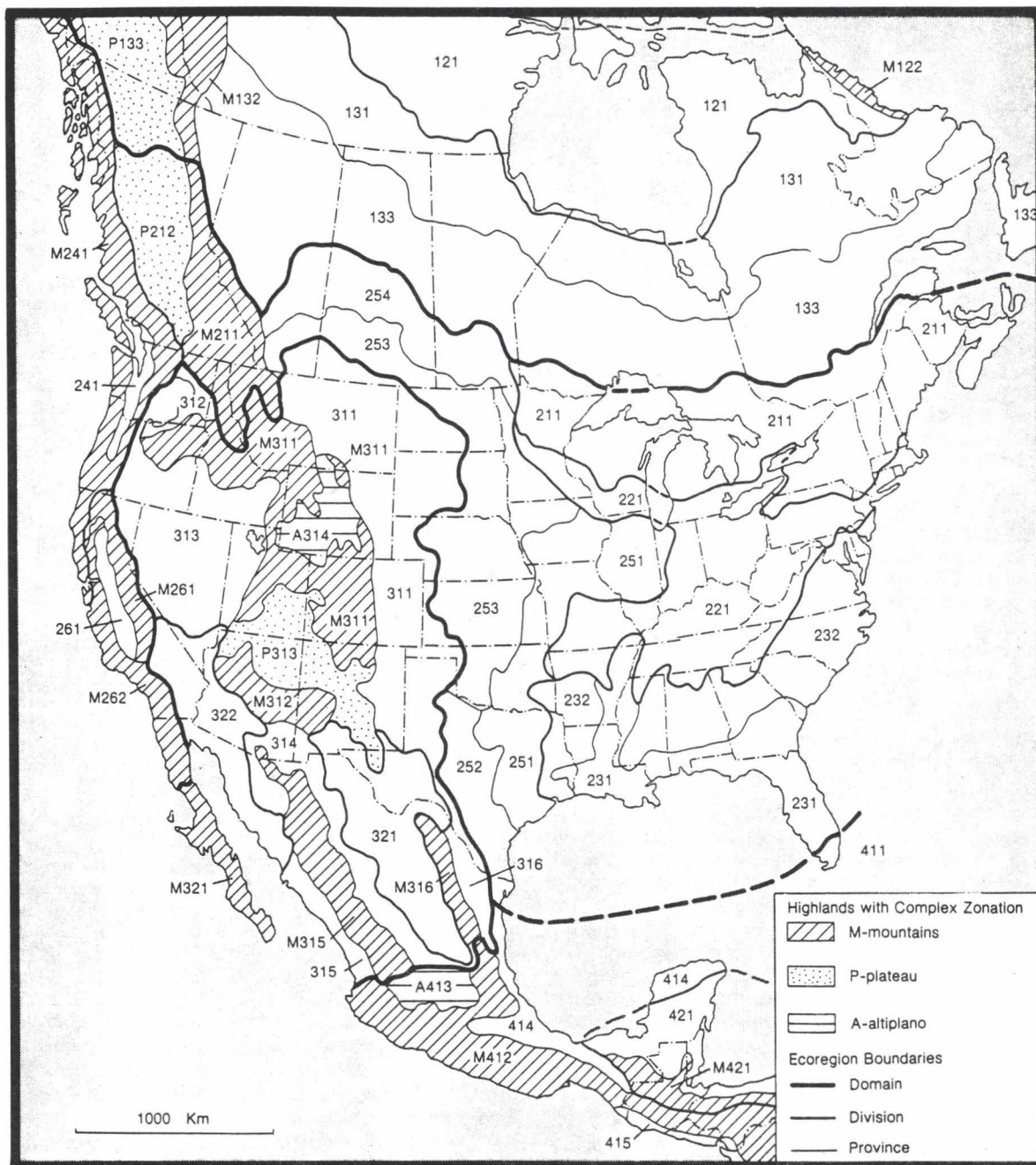


Figure 1.-The domains, divisions, and provinces for North America used in Land Systems Inventories. Note the location of the Rocky Mountain Forest Province (M311). Source: Bailey and Cushwa (1981).

OPEN HILLS AND MOUNTAINS

- C2 = Open low hills
- C3 = Open hills
- C4 = Open high hills
- C5 = Open low mountains
- C6 = Open high mountains

HILLS AND MOUNTAINS

- D3 = Hills
- D4 = High hills
- D5 = Low mountains
- D6 = High mountains

PLAINS WITH HILLS OR MOUNTAINS

- A3a, A3b, B3a, B3b = Plains with hills
- B4a, B4b = Plains with high hills
- B5a, B5b = Plains with low mountains
- B6a, B6b = Plains with high mountains

Classification and mapping at the landtype association level was performed in two steps: 1) compilation of mapped data for individual landscape elements; and 2) combination of the individual landscape element maps in a two-step overlay process.

Compilation of Mapped Data for Individual Landscape Elements

The geologic map for the Medicine Bow Mountains and Sierra Madre (Plate 1) was reproduced at the geologic formation level following the criteria outlined in Table 1. The source of mapped data is the "Geologic Map of Wyoming" prepared by Love and Christiansen (1985), the most detailed map covering both mountain ranges. An expanded version of the legend for Plate 2 is presented in Table 2. For further information, consult a summary of the geology of the region, including a roadlog, prepared by Hausel and Jones (1984). A more detailed geologic map of the Medicine Bow Mountains was prepared by Houston (1968).

The landforms map for the Medicine Bow Mountains and Sierra Madre (Plate 2) was developed at level V as specified in Tables 1 and 3. Landforms are defined as uniform topographic features in terms of: elevation, local relief, pattern and density of drainage, degree of channel incision, position in the landscape,

slope gradient. Mapping was produced from examination of topographic maps at a scale of 1:100,000 and color infrared transparencies at a scale of 1:58,000. An expanded version of the legend for Plate 2 is presented in Table 4. For further information, consult the U.S. Forest Service (1982) Region 10 Land System Inventory Handbook classification of landforms.

The vegetation map for the Medicine Bow Mountains and Sierra Madre (Plate 3) was compiled from the U.S. Forest Service geographic information system known by the acronym, "RIS," for Resource Information System. The boundaries of mapped units were derived from the RIS polygonal quadrangle maps. The dominant species for each RIS polygon was derived from codes in the following sections on the RIS data bank: 45.2 (nonforest, water and range cover type), 45.22 (tree, shrub, forb, and grass cover), 45.81 (range suitability), 46.21 (forest cover type). Also, information was extracted from RIS data bank schemas 225 (capability area), 415 (national forest and range type), and 417 (crown cover percent). The mapped units displayed in Plate 3 represent a generalization of the coded RIS polygons to be consistent with the scale and resolution guidelines for the Land Systems Inventory as described in Table 1. An expanded version of the legend for Plate 3 is presented in Table 5. For further information, consult an excellent classification of vegetation in the Medicine Bow National Forest (with no maps) prepared by Alexander et al. (1986) or the earlier, more brief summary by Porter (1963).

The soils map for the Medicine Bow Mountains and Sierra Madre (Plate 4) was reproduced from a map of soilscapes originally under the direction by soil scientists with the U.S. Forest Service (Art Bauer, personal communication). A soilscape is a group of one or more soil series consistently found in the same general landscape position. Soil morphology was described from field sampling, and some samples were collected for laboratory analysis and engineering tests. The results of these tests were used to determine to expected behavior of the soil under different uses. The boundaries of soilscape mapping units was largely determined with interpretation of aerial

Table 2.-Legend for the geology map in Plate 1.

<u>Map Symbol</u>	<u>Geologic Unit (and description)</u>
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PRECAMBRIAN CRYSTALLINE ROCKS

pw	Mafic intrusive rocks (Proterozoic and late Archean)
SZC	Shear zone of cataclastic (brittle metamorphic) rocks (created about 1.8 to 1.6 Ma)
Xdl	Deep Lake Group (quartzite, diamictite, pelitic schist, quartz-pebble conglomerate)
Xgy	Granite rocks (1,700 Ma age group)
Xlc	Libby Creek Group (pelitic schist, amphibole schist, quartzite, diamictite, quartz-pebble conglomerate, marble)
Xm	Mafic intrusive rocks (gabbro of Elkhorn Mountain (age 1,800 Ma))
Xqd	Quartz diorite (diorite of Twin Hills)
Xsv	Meta sedimentary and metavolcanic rocks (granite gneiss, felsic gneiss, amphibolite, hornblende gneiss, metavolcanic rocks)
Wg	Granitic rocks (2,600 Ma age group)
Wgn	Granite gneiss (age 2,600 to 3,100+ Ma)
WVsv	Metasedimentary and metavolcanic rocks (amphibolite, hornblende gneiss, biotite gneiss, quartzite, iron-formation, metaconglomerate, marble, pelitic schist; older than 2,600 Ma)
Ys	Sherman Granite (age 1,415 to 1,435 Ma)

MESOZOIC AND PALEOZOIC SEDIMENTARY ROCKS

kFT	Frontier Formation (sandstone and shale; Upper Cretaceous), Mowry Shale (shale and bentonite; Lower Cretaceous), Thermopolis shale (Shale and sandstone)
KJs	Cloverly (sandstone, claystone, conglomerate; Lower Cretaceous), Morrison (claystone, limestone, sandstone, Upper Jurassic), and Sundance Formations (sandstones and shale, Upper and Middle Jurassic)
Km	Meeteetse Formation (sandstone, claystone, tuff, coal; Upper Cretaceous)
Kmt	Mowry (Shale and bentonite; Lower Cretaceous) and Thermopolis Shales (shale and sandstone)
Kmv	Mesa Verde Formation (sandstone, shale, coal; Upper Cretaceous)
Kn	Niobrara Formation (Limestone and shale; Upper Cretaceous)
Ks	Steele Shale (shale, bentonite, sandstone; Upper Cretaceous)
MzPz	Mesozoic and Paleozoic Rocks: Chugwater Formation (sandstone and limestone; Lower Permian and Upper-Middle Pennsylvanian), Goose Egg Formation (sandstone, siltstone, gypsum, halite, dolomite, limestone; Lower Triassic and Permian), Casper Formation (sandstone and limestone; Lower Permian and Upper-Middle Pennsylvanian), and Fountain Formation (sandstone; Upper-Middle Pennsylvanian)
PPcf	Casper Formation (sandstone and limestone; Lower Permian and Upper-Middle Pennsylvanian), Fountain Formation (sandstone; Upper-Middle Pennsylvanian)
PPm	Wells Formation (limestone and sandstone; Lower Permian and Upper-Middle Pennsylvanian), Amsden Formation (shale, dolomite, sandstone; Middle-Lower Pennsylvanian and Upper Mississippian)
TrC	Chugwater Formation (siltstone and shale; Upper and lower Triassic)
TrPg	Goose Egg Formation (sandstone, siltstone, gypsum, halite, dolomite, limestone; Lower Triassic and Permian)

TERTIARY SEDIMENTARY AND IGNEOUS ROCKS

Tbf	Basalt Flows and Intrusive Igneous Rocks (age about 11 Ma)
Tbs	Battle Spring Formation (conglomerate; Eocene and Paleocene)
Tco	Coalmont Formation (sandstone, claystone, conglomerate; Eocene and Paleocene)
Tha	Hanna Formation (sandstone, shale, conglomerate, giant quartzite boulders; Paleocene)
Tm	Browns Park Formation (tuffaceous sandstone, marl, conglomerate; Miocene)
Tmu	North Park Formation (tuffaceous sandstone, siltstone, claystone, conglomerate; Upper Miocene)

QUATERNARY ROCKS AND UNCONSOLIDATED DEPOSITS

Qa	Alluvium and colluvium
Qg	Glacial deposits
Qls	Landslide deposits
Qt	Gravel, pediment, and fan deposits
QTc	Conglomerate (Pleistocene to Miocene)

Table 3.-Classification of landforms by order (after Pitty 1982).

<u>Order</u>	<u>Mapping Unit Resolution</u>	<u>Characteristics and Examples</u>	<u>Persistence (years)</u>
I	1,000,000's to 10,000,000's square miles	continents and ocean basins	1,000,000,000
II	100,000's to 1,000,000's square miles	large structural units: shields, platforms	100,000,000
III	1,000's to 100,000's square miles	large landforms controlled by structure: basins, domes, fault blocks	10,000,000
IV	10's to 1,000's square miles	mountains, hills, valleys	1,000,000
V	1's to 10's square miles	subtypes of level IV landforms	100,000
VI	0.01's to 1's square miles (6.4 to 640 ac)	ridges, terraces, cirques, moraines	10,000
VII	1's to 10's square feet	solifluction lobes, badland gullies	1000
VIII	.01's to .1's square feet	microscopic forms: solution pits, glacial polish	100

Table 4.-Legend for the landforms map in Plate 2.

<u>Map No.</u>	<u>Landform</u>	<u>Shape</u>	<u>Gradient</u>	<u>Local Relief (ft)</u>	<u>Drainage Pattern (& Frequency)</u>
ALPINE LANDFORM GROUP					
11	Rugged Alpine	Linear to Jagged	> 70%	1000-3000	Undeveloped to Rectangular
12	Rounded Alpine	Rounded to Smooth	> 70%	500-1500	Dendritic to Rectangular
13	Permanent Ice and Snow (np)	Concave to Convex	0-100%	200-5000	Englacial, Subglacial
14	Cirque Basins (np)	Concave	> 5%	200-500	Convergent Parallel
SNOW AVALANCHE LANDFORM GROUP					
21	Snow Avalanche Slope	Linear	75-150%	200-1500	Parallel (10/sq.mi.)
22	Snow Storage Slope	Linear	60-100%	300-600	Undeveloped
MOUNTAIN SLOPE LANDFORM GROUP					
31	Highly Dissected, Deeply Incised, Mountain Slope	Linear	35-90%	500-1500	Parallel (10/sq.mi.)
32	Highly Dissected, Shallowly Incised, Mountain Slope	Linear	35-90%	500-1500	Parallel (10/sq.mi.)
33	Moderately Dissected, Deeply Incised, Mountain Slope	Linear	35-90%	500-1500	Parallel (3-9/sq.mi.)
34	Moderately Dissected, Shallowly Incised, Mountain Slope	Linear	35-90%	500-1500	Parallel (3-9/sq.mi.)
35	Infrequently Dissected, Deeply Incised, Mountain Slope	Linear	35-90%	500-1500	Parallel (1-2/sq.mi.)
36	Infrequently Dissected, Shallowly Incised, Mountain Slope	Linear to Convex	35-90%	500-1500	Deranged (1-2/sq.mi.)
37	Canyon	Linear	> 65%	500-1500	Undeveloped to Parallel
HILLSLOPE LANDFORM GROUP					
41	Hill Summit and Ridgetop	Convex	10-35%	100-500	Deranged to Dendritic (1-2/sq.mi.)
42	Rolling Hills	Convex	10-75%	200-500	Dendritic, Parallel (1-2/sq.mi.)
43	Highly Dissected, Deeply Incised, Hillslope (np)	Concave to Linear	35-90%	200-700	Parallel (3-9/sq.mi.)
44	Moderately Dissected, Shallowly Incised, Hillslope (np)	Concave to Linear	35-90%	200-700	Parallel (3-9/sq.mi.)
45	Infrequently Dissected, Shallowly Incised, Hillslope	Convex	10-70%	50-700	Parallel (1-2/sq.mi.)
VALLEY LANDFORM GROUP					
51	Undissected Footslope (np)	Concave	10-40%	50-100	Parallel to Dendritic (10/sq.mi.)
52	Dissected Footslope	Concave	10-35%	50-100	Parallel (10/sq.mi.)
53	Floodplain	Linear	0-5%	0-300	Single or anastomosing channel
PLAIN AND PLATEAU LANDFORM GROUP					
61	Flat Lowland (np)	Linear	0-5%	0-50	Deranged (1-2/sq.mi.)
62	Rolling Lowland	Rolling to Linear	0-20%	100-500	Undeveloped to Deranged (1-2/sq.mi.)
63	Rolling Plateau (np)	Rolling to Linear	20-50%	100-500	Undeveloped to Deranged (1-2/sq.mi.)

Source: U.S. Forest Service (1982)

Table 5.-Legend for the vegetation map in Plate 3.

Map Symbol	Vegetation Map Unit: Example Location and Habitat
CONIFEROUS FOREST VEGETATION GROUP	
DF	Douglas Fir Forest (<u>Pseudotsuga menziesii</u>) -often at lower end of forest in open stands -in more mesic sites than Ponderosa pine -poorly represented today in the forest, heavily logged in the past
LI	Limber Pine Forest (<u>Pinus flexilis</u>) -most extensive stands occur on Pole Mountain -in open stands on dry, rocky ridgetops, SW aspects
LP	Lodgepole Pine Forest (<u>Pinus contorta</u>) -occurrence in large stands attributed to widespread & repeated fires -thrives best on moderately acid sands or gravelly loams that are well drained to excessively well drained -commercial logging has created less mature, more dense stands -dominant stands in southern portion of Medicine Bow Mountains -otherwise located at elevations below spruce-fir zone
PP	Ponderosa Pine Forest (<u>Pinus ponderosa</u>) -largely restricted to Laramie Peaks -only a few stands in the Snowy Range and Pole Mountain areas -on deep, well-drained, sandy-gravelly or clay-loam soils
SF	Engelmann Spruce & Subalpine Fir (<u>Picea engelmannii</u> & <u>Abies lasiocarpa</u>) -found on all aspects at elevations between 8,000 and 11,500 feet -krummholz (dwarf, flagform trees) forms at upper limit
DECIDUOUS FOREST VEGETATION GROUP	
A	Aspen (<u>Populus tremuloides</u>) -large stable stands on SW slope of Sierra Madre -found in some areas where fires have destroyed conifers -appear to be climax vegetation in other areas -common at lower end of lodgepole pine zone along streams
GO	Gambel Oak (<u>Quercus gambelii</u>) -best developed at elevations between 5,000 and 8,000 feet -dry foothills and canyon walls of Sierra Madre and Laramie Peaks area
SB	Rangeland or Mixed deciduous (including some sagebrush and grassland dominated areas) -Mountain Mahogany and Sagebrush often dominate -Juniper may occur as small scattered trees or shrubs -short grass prairie in areas devoid of shrubs, including Blue Grama, Bluegrass, Junegrass, Needlegrass, Wheatgrass
OTHER VEGETATION	
GR	Alpine tundra -herbaceous vegetation with a few small shrubs -Libby Flats and highest elevations along Continental Divide
R	Rockland -rocky summits, scree slopes, snowbanks -Snowy Range

Source: Porter (1962), Shelford (1963), Alexander et al. (1986)

photographs. An expanded version of the legend for Plate 4 is presented in Table 6. Standard soil surveys for this region of southeastern Wyoming have not yet been completed by the U.S. Soil Conservation Service.

Combination of Maps in the Overlay Process

The maps of geology (Plate 1) and landforms (Plate 2) were combined in an overlay process to delineate lithomorphologic units (Plate 5). This combination is premised on a large volume of literature that documents the geographical association of certain landforms with distinct lithologic units (e.g., Chorley et al. 1984). In order to adhere to the guidelines for scale and resolution for the Land Systems Inventory listed in Table 1, some generalization was required on

both the geology map and the landforms map before the overlay process could begin. The geologic formations mapped in Plate 1 were grouped as either crystalline, sedimentary, or Quaternary lithologic units. The landforms mapped in Plate 2 were grouped as either rugged alpine, rounded hills, avalanche slopes, dissected slopes, canyons, or flat lowlands. The legend for Plate 5 is reproduced in Table 7.

The maps of vegetation (Plate 3) and soils (Plate 4) were combined in an overlay process to delineate terrestrial ecosystems (Plate 6). This combination is premised on a large volume of literature that documents that vegetation development and soil development are intimately connected (e.g., Eyre 1968). The legend for the terrestrial ecosystems map is simply a combination of the legend for the vegetation map (Table 5) and soils map (Table 6).

Table 6.-Legend for the soils map in Plate 4.

Map No.	Soil Mapping Unit (general landscape position)
GENTLY SLOPING, WELL DRAINED, DEEP SOILS	
2	Shakespeare-Granite-Taglake (on tablelands)
3	Cowdrey-Burnette-Brinkert (on sedimentary tablelands)
5	Hanson-Zeesix Taxajunct (on highly calcareous pediments)
13	Loberg-Jefflake (on sedimentary subalpine mountain slopes)
18	Cowdrey-Mayoworth-Heath (on rolling tablelands)
STEEP, WELL DRAINED, MODERATELY DEEP SOILS	
1	Rogert-Irigul-Buhrig-like (in canyons)
6	Devore-Agreston-Baula (Blacklead) (on mountain slopes)
9	Endlich-Granadier-Moran (on subalpine mountain slopes)
11	Frisco-Granite-Shakespeare (on subalpine moraines)
16	Angostrura Taxajunct-Conical (on sedimentary mountain slopes)
17	Leavitt-Supervisor-Herbman (on mountain slopes and ridgetops)
MODERATELY SLOPING, WELL DRAINED, DEEP SOILS	
4	Legault-Herbman-Bowen (on Sheep Mountain)
7	Frisco-Granite (on glacial till plains and moraines)
8	Ansel-Presa (on conglomeratic mountain slopes)
15	Baula-Frisco-Kettle Holes (on glacial till plains)
LEVEL, POORLY DRAINED, DEEP SOILS	
10	Cryoborolls-Cryaquepts-Cryohemists (on hummocky subalpine moraines)
12	Cryaquolls-Cryaborolls (on floodplains)
OTHER	
14	Rock Outcrop

Table 7.-Legend for the lithomorphic unit map in Plate 5.

Map No.	Lithomorphic Unit
1	Rugged Alpine with Crystalline Lithology
2	Rounded Hills with Crystalline Lithology
3	Rounded Hills with Sedimentary Lithology
4	Rounded Hills Mantled with Quaternary Deposits
5	Avalanche Slopes with Crystalline Lithology
6	Dissected Slopes with Crystalline Lithology
7	Dissected Slopes with Sedimentary Lithology
8	Dissected Slopes Mantled with Quaternary Deposits
9	Canyons with Crystalline Lithology
10	Canyons with Sedimentary Lithology
11	Canyons Mantled with Quaternary Deposits
12	Flat Lowlands with Crystalline Lithology
13	Flat Lowlands with Sedimentary Lithology

The maps of lithomorphic units (Plate 5) and terrestrial ecosystems (Plate 6) were combined in an overlay process to delineate landtype associations (Plate 7). At each step in the overlay process, problems in the lack of correspondence between boundaries of component maps were resolved following the guidelines established by Omernik (1987). An expanded version of the legend for Plate 7 is presented in Table 8.

LAND CAPABILITY ANALYSIS

A preliminary assessment of land capability for each landtype association is presented in Table

9. Ratings are presented regarding timber value, forage value, wildlife value, potential for increasing water yield, potential for increasing erosion (including land surface erosion and mass wasting). Ratings for these resource values were developed by Alexander et al. (1986) using only vegetation. Those ratings have been modified, therefore, to account for the composite effects of lithology, landforms, and soils. It is anticipated that ratings will be developed by forest personnel over time for additional resource values related to visual management, recreation, fire management, and fisheries.

Table 8.-Legend for the landtype association map in Plate 7.

Map No.	Landtype Association (Example Localities) and Basic Characteristics
1	Bare Crystalline High Mountains (Snowy Range) a. rockland vegetation b. mountain slope landforms group at higher elevations c. crystalline lithology d. rockland soils
2	Alpine Quaternary-Mantled High Hills (Twin Lakes) a. spruce-fir forest vegetation b. Quaternary deposits over crystalline bedrock c. rounded alpine landforms at higher elevations d. rockland soils; or well drained, shallow to moderately deep soils
3	Alpine Crystalline High Hills (Libby Flats) a. alpine tundra vegetation b. crystalline rock with occasional Quaternary deposits c. rounded alpine landforms at higher elevations d. well drained, shallow to moderately deep soils
4	Coniferous Crystalline High Hills (Continental Divide in Sierra Madre, crest of Sheep Mountain) a. coniferous forest vegetation b. crystalline bedrock c. rounded alpine or snow storage slope landforms at higher elevations d. well drained, moderately deep to deep soils
5	Coniferous Sedimentary High Hills (Sawmill Park, Lake Mountain) a. lodgepole pine vegetation b. Tertiary sedimentary rocks (predominately sandstone) c. rounded hills at higher elevations d. well drained, moderately deep to deep soils
6	Coniferous Quaternary-Mantled High Mountains (Rock Creek Ridge, Kennaday Peak) a. coniferous or rockland vegetation b. conglomerate or landslide deposits c. moderately dissected mountain slopes d. well drained, deep soils (predominately Lowberg-Jefflake soils)
7	Coniferous Quaternary-Mantled Low Hills/with shallow soils (Snowy Range Natural Area) a. coniferous forest vegetation b. quaternary deposits c. deeply incised mountain slopes or rolling hills d. well drained, shallow to moderately deep soils
8	Rangeland Quaternary-Mantled Low Hills (SE slopes of Sheep Mountain, Tenmile area) a. mixed deciduous (predominately sagebrush) vegetation b. Quaternary deposits c. rolling hills d. deep soils
9	Coniferous Quaternary-Mantled Hills/with deep soils (Hardin Creek) a. coniferous forest vegetation b. glacial deposits c. rounded alpine landforms d. moderately deep to deep soils

- 10 Rangeland Crystalline/Quaternary-Mantled Low Mountains (SE corner of national forest)
 - a. mixed deciduous (predominately sagebrush) vegetation
 - b. crystalline bedrock
 - c. moderately dissected, shallowly incised mountain slopes at lower elevations
 - d. steep, well drained, moderately deep soils
- 11 Coniferous Sedimentary Low Mountains (Middle French Creek)
 - a. coniferous forest vegetation
 - b. sedimentary or crystalline bedrock
 - c. moderately dissected, shallowly incised mountain slopes at lower elevations
 - d. well drained, moderately deep to deep soils
- 12 Mixed Forest Crystalline Low Mountains (Mullen Creek drainage, major areas in Sierra Madre)
 - a. mixed coniferous-aspen forest vegetation
 - b. crystalline bedrock
 - c. moderately dissected mountain slopes
 - d. steep, well drained, moderately deep soils
- 13 Coniferous Crystalline Mountains (south half of Medicine Bow Mountains)
 - a. lodgepole pine forest vegetation
 - b. crystalline bedrock
 - c. moderately dissected, shallowly incised mountain slopes
 - d. gently sloping, well drained, deep soils
- 14 Coniferous Sedimentary Mountains (Belvidere Ditch region)
 - a. coniferous-aspen forest vegetation
 - b. sandstone bedrock
 - c. shallowly incised mountain slopes
 - d. gently sloping, well drained, deep soils
- 15 Mixed Forest Sedimentary Mountains (Cassidy Creek drainage)
 - a. coniferous-aspen forest vegetation
 - b. sedimentary bedrock
 - c. moderately dissected, shallowly incised mountain slopes
 - d. well drained, moderately deep to deep soils
- 16 Rangeland Sedimentary Low Mountains (west of Cottonwood Rim)
 - a. mixed deciduous vegetation
 - b. sandstone bedrock
 - c. mountain slopes at lower elevations
 - d. gently sloping, well drained, deep soils
- 17 Mixed Forest Sedimentary Hills (Douglas Point)
 - a. lodgepole pine-mixed deciduous-aspen vegetation
 - b. sandstone bedrock
 - c. moderately dissected, shallowly incised mountain slopes
 - d. well drained, moderately deep to deep soils
- 18 Mixed Forest Quaternary-Mantled Low Mountains (Deep Creek Campground, Jack Creek drainage)
 - a. coniferous-aspen forest vegetation
 - b. glacial deposits
 - c. mountain slopes at lower elevations
 - d. deep soils
- 19 Open Coniferous Quaternary-Mantled Mountains (Brooklyn Lake)
 - a. coniferous forest vegetation
 - b. glacial deposits
 - c. mountain slopes
 - d. deep soils

- 20 Coniferous Crystalline Canyons (South French Creek, Douglas Creek, Encampment River)
a. lodgepole pine and spruce-fir forest vegetation
b. crystalline bedrock
c. canyons
d. steep, well-drained, shallow to moderately deep soils (predominately Rogert-Irigul-Buhrig like soils)
- 21 Rangeland Crystalline Canyons (North Gate Canyon)
a. rangeland vegetation
b. crystalline bedrock
c. canyons
d. steep, well-drained, shallow to moderately deep soils (predominately Rogert-Irigul-Buhrig like soils)
- 22 Open Coniferous Crystalline Flat Lowlands (slopes west of Woods Landing)
a. open coniferous or rangeland vegetation
b. crystalline bedrock
c. rolling lowlands
d. well-drained, moderately deep to deep soils
- 23 Coniferous Sedimentary Flat Lowlands (upper Centennial Valley)
a. rangeland and open coniferous forest vegetation
b. sedimentary bedrock
c. rolling lowlands
d. gently sloping, well drained, deep soils
- 24 Rangeland Quaternary-Mantled Valleys (Casteel Creek-Middle Fork Big Creek junction)
a. rangeland vegetation
b. Quaternary alluvium over sedimentary or crystalline bedrock
c. undissected footslopes and floodplains
d. moderately drained, deep soils
- 25 Open Deciduous Sedimentary Canyons (Little Sandstone Creek, Battle Creek)
a. rangeland-aspen vegetation
b. sedimentary bedrock
c. canyons
d. steep, well-drained, shallow to moderately deep soils (predominately Rogert-Irigul-Buhrig like soils)
- 26 Open Deciduous Sedimentary Low Hills (east of Cottonwood Rim)
a. aspen forest vegetation
b. sedimentary bedrock
c. rolling hills at lower elevations
d. gently sloping, well drained, deep soils (predominately Cowdrey-Burnette-Brinkert soils)
-

Table 9.-Land capability ratings for the landtype associations.

<u>LTA</u>	<u>Timber</u>	<u>Forage</u>	<u>Wildlife</u>	<u>Water</u>	<u>Erosion</u>
1	LOW	LOW	LOW	LOW	LOW
2	LOW	MODERATE	MODERATE	HIGH	MODERATE
3	LOW	LOW	LOW	LOW	MODERATE
4	MODERATE	MODERATE	MODERATE	HIGH	HIGH
5	MODERATE	LOW	LOW	MODERATE	MODERATE
6	MODERATE	LOW	LOW	MODERATE	MODERATE
7	LOW	MODERATE	MODERATE	HIGH	HIGH
8	LOW	HIGH	HIGH	LOW	HIGH
9	MODERATE	MODERATE	MODERATE	HIGH	MODERATE
10	LOW	HIGH	HIGH	MODERATE	MODERATE
11	MODERATE	LOW	LOW	MODERATE	MODERATE
12	MODERATE	MODERATE	HIGH	HIGH	MODERATE
13	MODERATE	LOW	LOW	HIGH	MODERATE
14	MODERATE	MODERATE	HIGH	MODERATE	MODERATE
15	MODERATE	MODERATE	HIGH	MODERATE	MODERATE
16	LOW	HIGH	HIGH	LOW	HIGH
17	MODERATE	LOW	MODERATE	MODERATE	MODERATE
18	MODERATE	MODERATE	MODERATE	MODERATE	HIGH
19	LOW	MODERATE	MODERATE	MODERATE	HIGH
20	LOW	LOW	MODERATE	LOW	HIGH
21	LOW	LOW	MODERATE	LOW	HIGH
22	LOW	HIGH	HIGH	LOW	MODERATE
23	MODERATE	HIGH	HIGH	LOW	LOW
24	LOW	HIGH	HIGH	LOW	MODERATE
25	LOW	HIGH	HIGH	LOW	MODERATE
26	MODERATE	MODERATE	HIGH	LOW	MODERATE

Source: after Alexander et al. (1986)



Figure 3.-LTA #1 - Bare Crystalline High Mountains. View looking west toward the Snowy Range in the Medicine Bow Mountains.



Figure 4.-In background: LTA #2 - Alpine Quaternary-Mantled High Hills. In foreground: LTA#1, view looking northeast toward North Twin Lakes in the Medicine Bow Mountains.

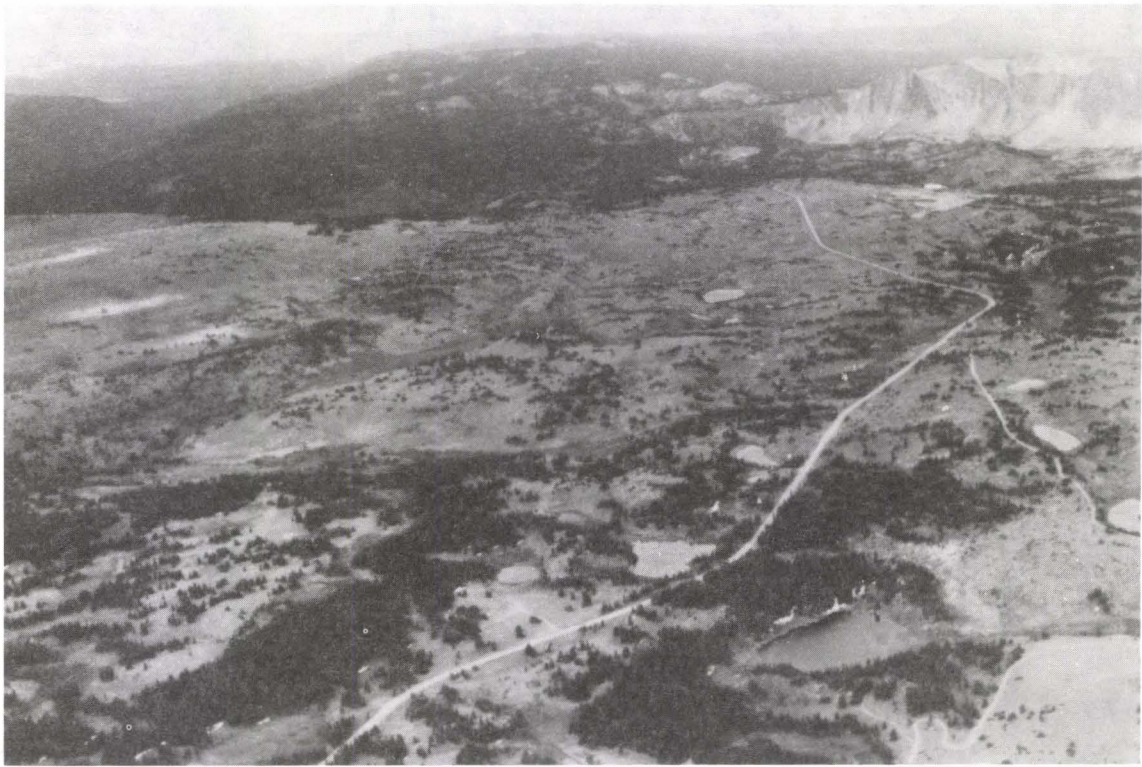


Figure 5.-In the foreground and middle ground: LTA #3 - Alpine Crystalline High Hills, view looking west across Libby Flats in the Medicine Bow Mountains. In the background: LTAs 1, 4, 20.



Figure 6.-LTA #4 - Coniferous Crystalline High Hills, view looking north across the crest of Sheep Mountain.



Figure 7.-At right in the middleground: LTA #5 - Coniferous Sedimentary High Hills, view looking northeast toward Sawmill Park in the Medicine Bow Mountains.



Figure 8.-In the middleground: LTA #6 - Coniferous Quaternary-Mantled High Mountains, view looking south toward Rock Creek Ridge in the Medicine Bow Mountains.

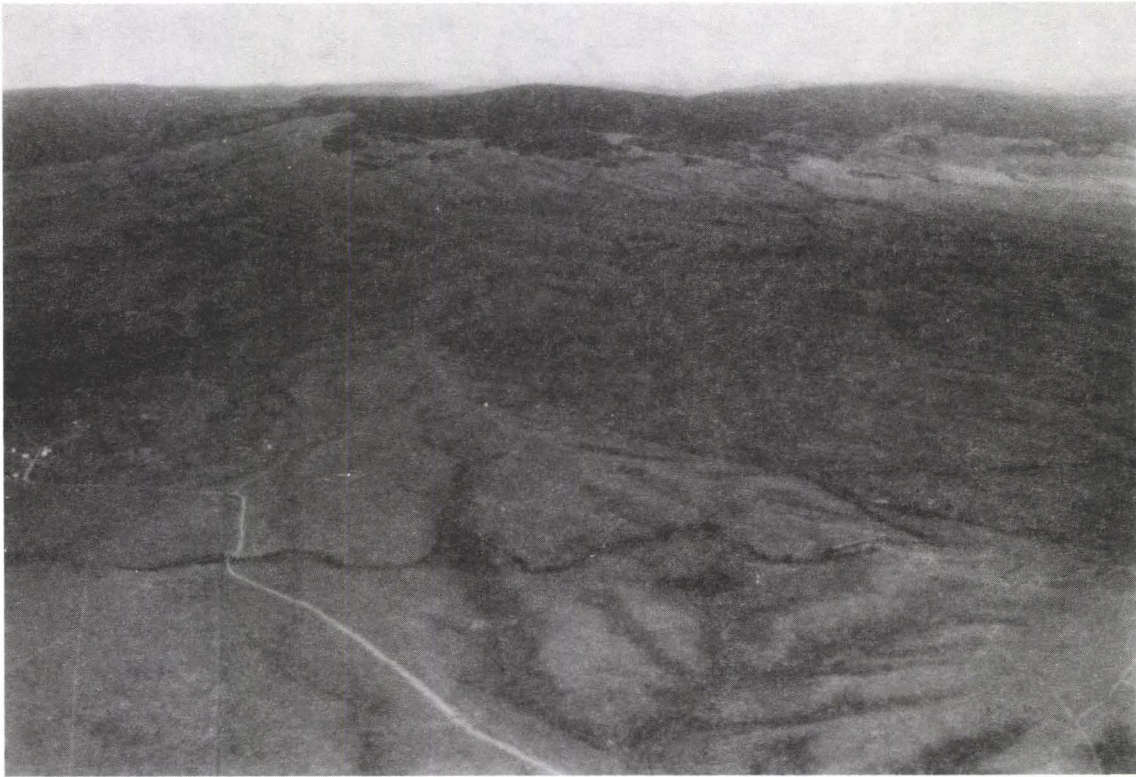


Figure 9.-In the foreground and middleground: LTA #7 - Coniferous Quaternary Mantled Low Hills/with shallow soils, view looking west across eastern slope of Medicine Bow Mountains.



Figure 10.-In the foreground and middleground: LTA #8 - Rangeland Quaternary Mantled Low Hills, view looking west toward southeast slope of Sheep Mountain.



Figure 11.-In the foreground and middleground: LTA #9 - Coniferous Quaternary Mantled Hills/with deep soils, view looking north across Hardin Creek area in the Medicine Bow Mountains.



Figure 12.-To the lower left: LTA #10 - Rangeland Crystalline/Quaternary Mantled Low Mountains, view looking southwest toward the southeast corner of Medicine Bow National Forest.



Figure 13.-LTA #11 - Coniferous Sedimentary Low Mountains, view looking northwest across Middle French Creek drainage in the Medicine Bow Mountains.



Figure 14.-LTA #12 - Mixed Forest Crystalline Low Mountains, view looking northwest toward terrain below Willow Peak in the Sierra Madre.



Figure 15.-In the foreground and middleground: LTA #13 - Coniferous Crystalline Mountains, view looking north toward Rob Roy Reservoir in the Medicine Bow Mountains.



Figure 16.-In the foreground: LTA #14 - Coniferous Sedimentary Mountains, view looking east toward Belvidere Ditch in the Sierra Madre.



Figure 17.-LTA #15 - Mixed Forest Sedimentary Mountains, view looking west across Cassidy Creek drainage in the Medicine Bow Mountains.



Figure 18.-Along lower slopes of mountain: LTA #16 - Rangeland Sedimentary Low Mountains, view looking northwest along southeast border of Sierra Madre.



Figure 19.-In the foreground and middleground: LTA #18 - Mixed Forest Quaternary Mantled Low Mountains, view looking south toward Bridger Peak in the Sierra Madre. No photograph of LTA #17 available.



Figure 20.-In the middleground: LTA #19 - Open Coniferous Quaternary Mantled Low Mountains, view looking southwest up North Fork Encampment River in the Sierra Madre. In the foreground: LTA #12.

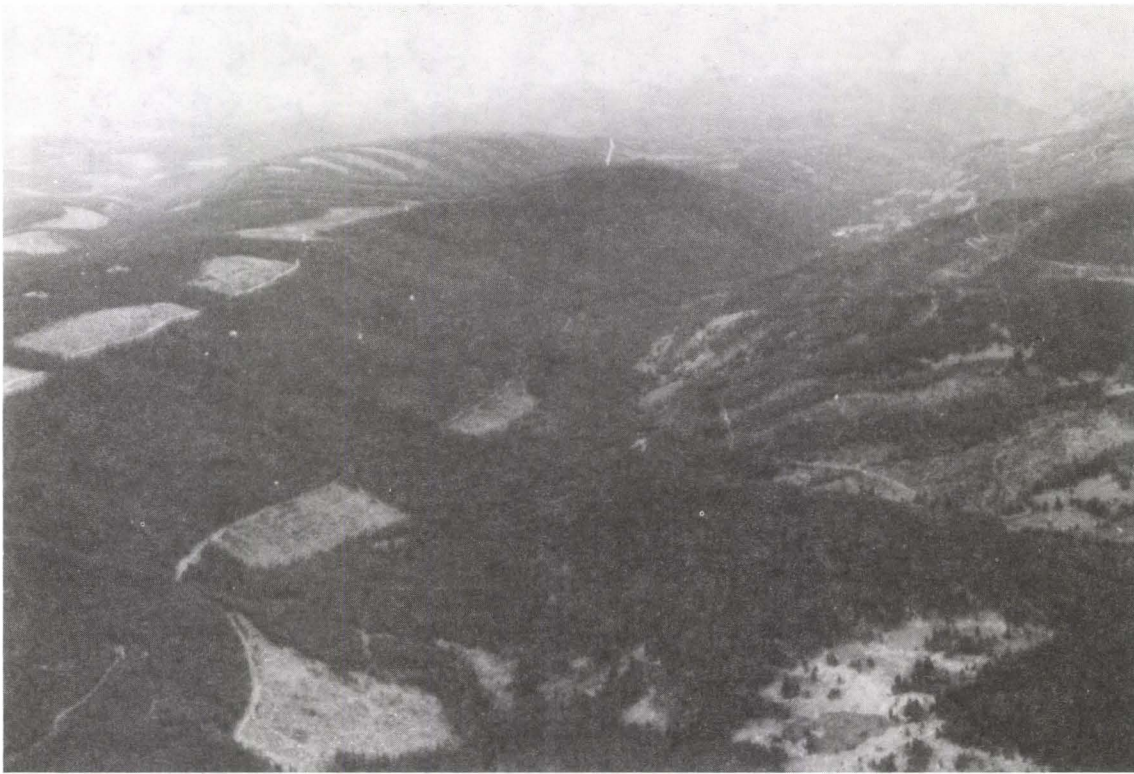


Figure 21.-LTA #20 - Coniferous Crystalline Canyons, view looking southeast down French Creek drainage in the Medicine Bow Mountains.



Figure 22.-LTA #21 - Rangeland Crystalline Canyons, view looking west toward lower Douglas Creek drainage in the Medicine Bow Mountains.



Figure 23.-In the middleground: LTA #24 - Rangeland Quaternary Mantled Valleys, view looking southwest toward Sheep Mountain. No photos available of LTAs 22 and 23.



Figure 24.-LTA #25 - Open Deciduous Sedimentary Canyons, view looking north toward Battle Creek in the Sierra Madre.



Figure 25.-In the middleground: LTA #26 - Open Deciduous Sedimentary Low Hills, view looking northwest toward Cottonwood Rim in the Sierra Madre.

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GEOLOGY

MEDICINE BOW NATIONAL FOREST

WYOMING

SIXTH PRINCIPAL MERIDIAN

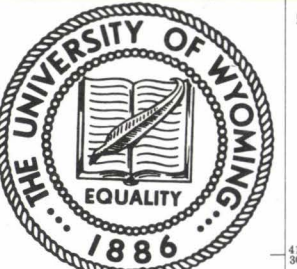
1973

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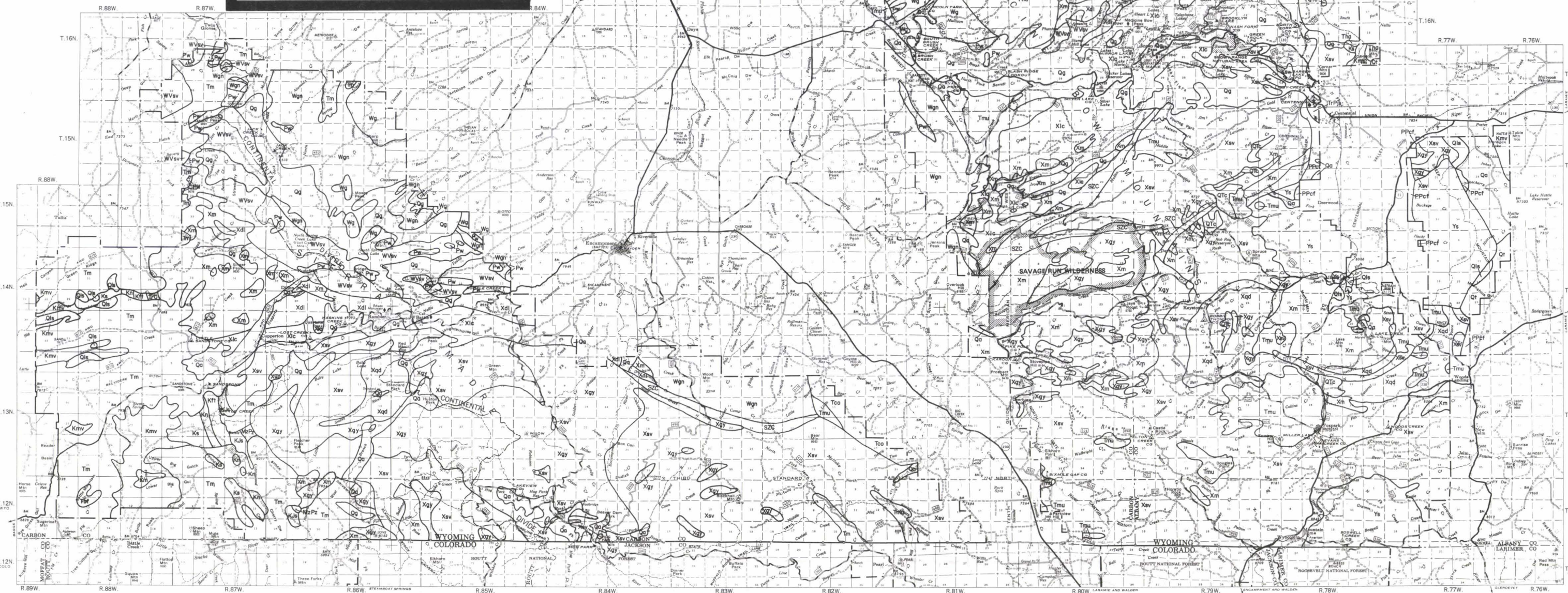
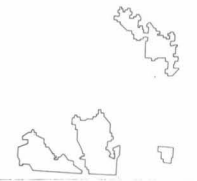
PRECAMBRIAN CRYSTALLINE ROCKS	
Pw	Granitic rocks
SZC	Shear zone of cataclastic (brittle metamorphic) rocks
Xdl	Deep Lake Group
Xy	Granitic rocks
SLC	Lobby Creek Group
SM	Mafic intrusive rocks
SGD	Quartz diorite
Xav	Metasedimentary & metavolcanic rocks
Wg	Granitic rocks
Wgn	Granite gneiss
WVav	Metasedimentary and metavolcanic rocks
Ts	Sheridan Granite
MESOZOIC AND PALEOZOIC SEDIMENTARY ROCKS	
Kft	Frontier Formation, Hovory Shale, Theropoda Shale
KJL	Clovis, Hovory, and Sundance Formations
TS	Hastings Formation
Kxt	Hovory and Theropoda Shales
Xav	Hovory Shale Formation
KS	Kiowa Formation
KS	Shinarump Shale
NEOZOIC AND PALEOZOIC ROCKS: Chugwater Formation, Goose Egg Formation, Casper Formation, and Fountain Formation	
PPcf	Casper Formation
PPF	Walla Formation
TrC	Chugwater Formation
TrPg	Goose Egg Formation
TERTIARY SEDIMENTARY AND IGNEOUS ROCKS	
TST	Basaltic flows and intrusive igneous rocks
Tba	Battle Spring Formation
Tco	Coalbrook Formation
Tth	Hanna Formation
Tm	Brown Park Formation
Tsu	South Park Formation
QUATERNARY ROCKS AND UNCONSOLIDATED DEPOSITS	
Qa	Alluvium and colluvium
Qd	Diluvial deposits
Qls	Landslide deposits
Qf	Drift, pediment, and fan deposits

NOTE: See text of report for more detailed legend

PLATE 1



MAP KEY

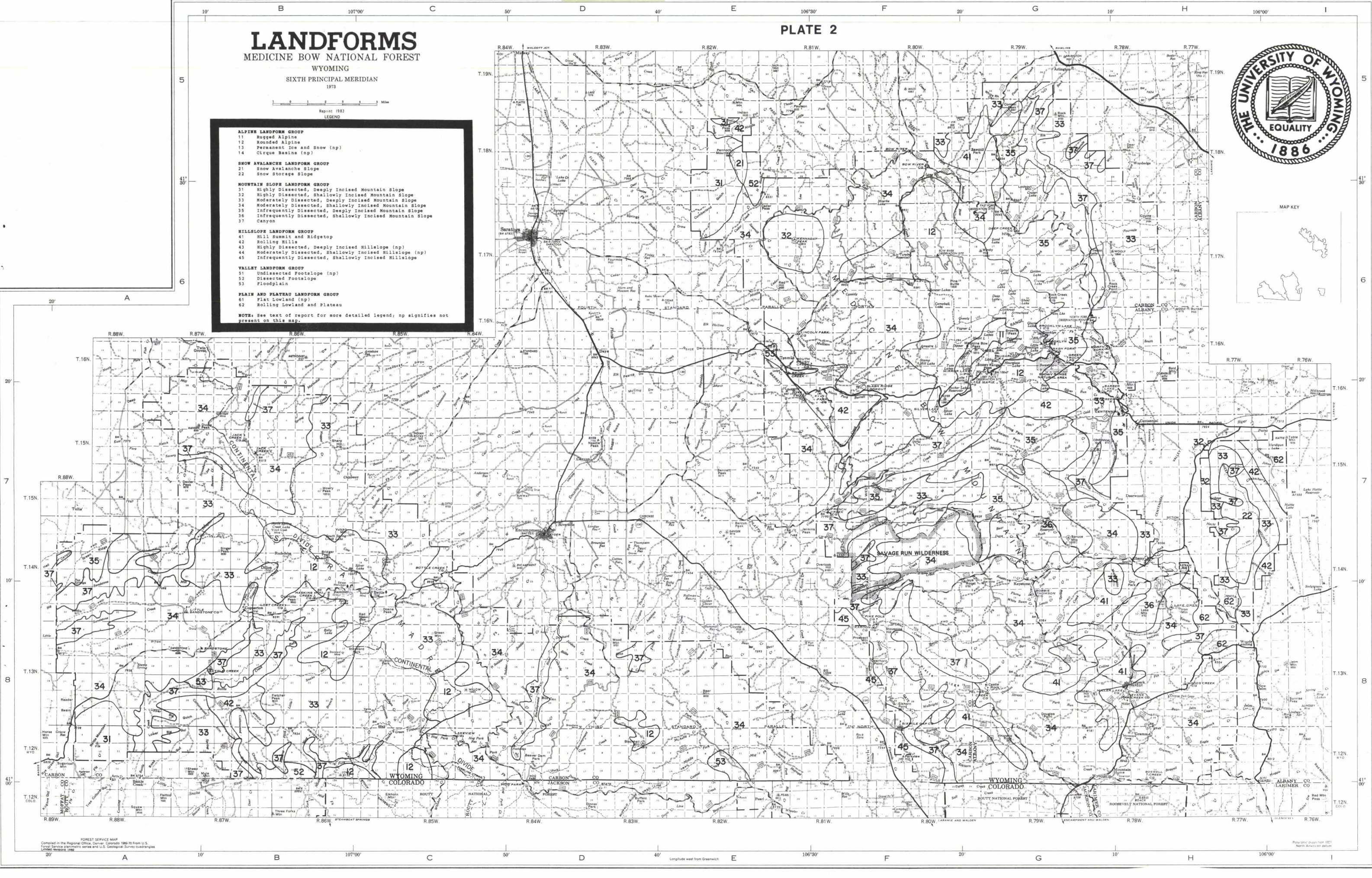
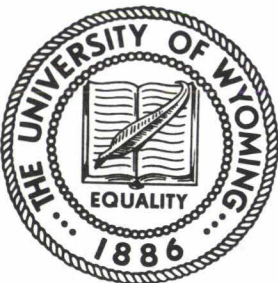


LANDFORMS
MEDICINE BOW NATIONAL FOREST
WYOMING
SIXTH PRINCIPAL MERIDIAN
1973



- ALPINE LANDFORM GROUP**
11 Rugged Alpine
12 Rounded Alpine
13 Permanent Ice and Snow (np)
14 Cirque Basins (np)
- SNOW AVALANCHE LANDFORM GROUP**
21 Snow Avalanche Slope
22 Snow Storage Slope
- MOUNTAIN SLOPE LANDFORM GROUP**
31 Highly Dissected, Deeply Incised Mountain Slope
32 Highly Dissected, Shallowly Incised Mountain Slope
33 Moderately Dissected, Deeply Incised Mountain Slope
34 Moderately Dissected, Shallowly Incised Mountain Slope
35 Infrequently Dissected, Deeply Incised Mountain Slope
36 Infrequently Dissected, Shallowly Incised Mountain Slope
37 Canyon
- HILLSLOPE LANDFORM GROUP**
41 Hill Summit and Ridgetop
42 Rolling Hills
43 Highly Dissected, Deeply Incised Hillslope (np)
44 Moderately Dissected, Shallowly Incised Hillslope (np)
45 Infrequently Dissected, Shallowly Incised Hillslope
- VALLEY LANDFORM GROUP**
51 Undissected Footslope (np)
52 Dissected Footslope
53 Floodplain
- PLAIN AND PLATEAU LANDFORM GROUP**
61 Flat Lowland (np)
62 Rolling Lowland and Plateau
- NOTE:** See text of report for more detailed legend; np signifies not present on this map.

PLATE 2



FOREST SERVICE MAP
Compiled in the Regional Office, Denver, Colorado 1969-70 from U.S.
Forest Service cadastral series and U.S. Geological Survey quadrangles
Limited revision, 1982

Publication from 1973
North American Datum

VEGETATION

MEDICINE BOW NATIONAL FOREST

WYOMING

SIXTH PRINCIPAL MERIDIAN
1973

Reprint 1983
LEGEND

CONIFEROUS FOREST VEGETATION GROUP

DF Douglas Fir Forest
LI Limer Pine Forest
LP Lodgepole Pine Forest
PP Ponderosa Pine Forest
SF Engelmann Spruce and Subalpine Fir

DECIDUOUS FOREST VEGETATION GROUP

A Aspen
GO Gambel Oak
SB Mixed deciduous (including some sagebrush and grassland dominated areas)

OTHER VEGETATION

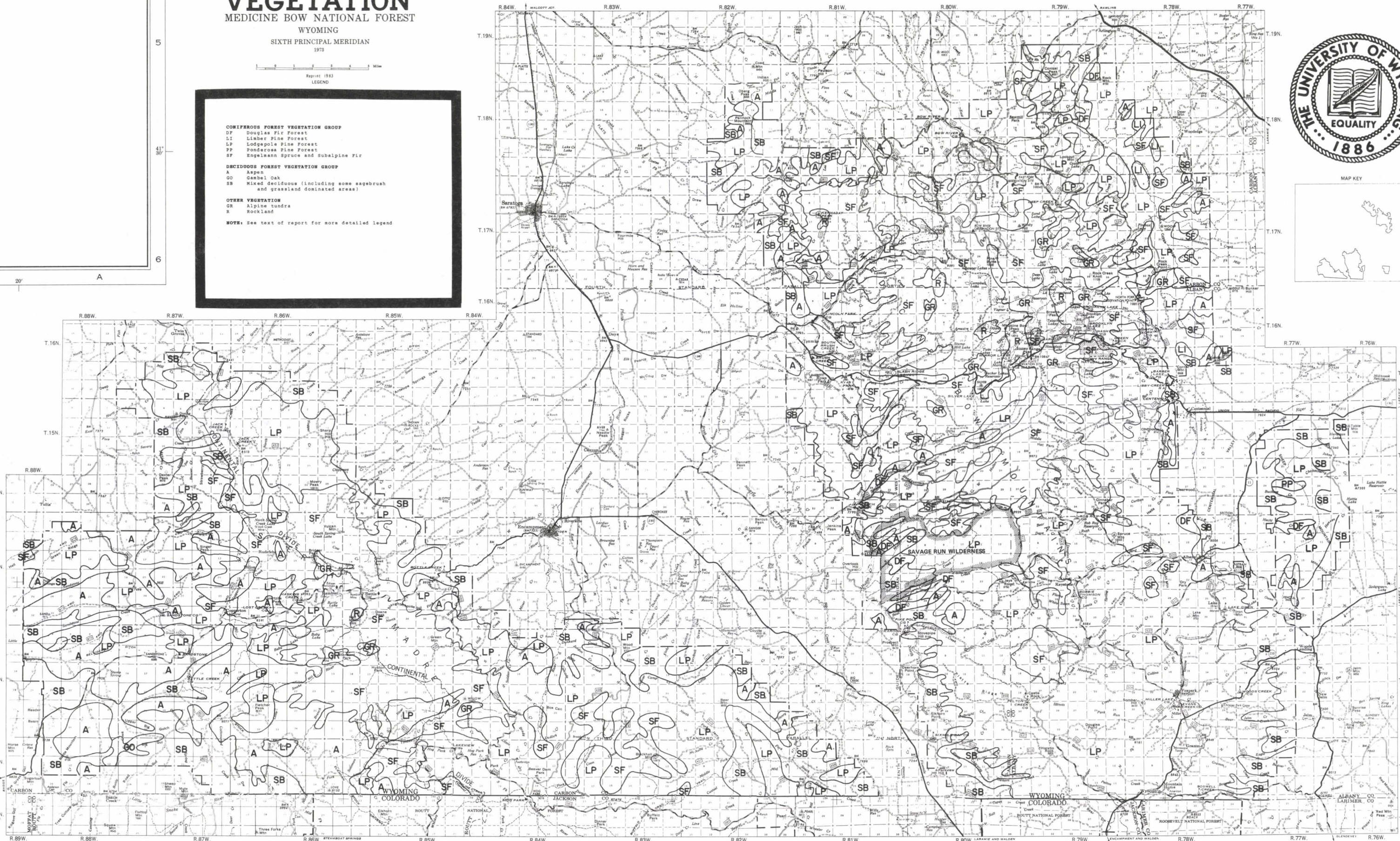
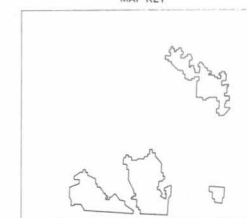
GR Alpine tundra
R Rockland

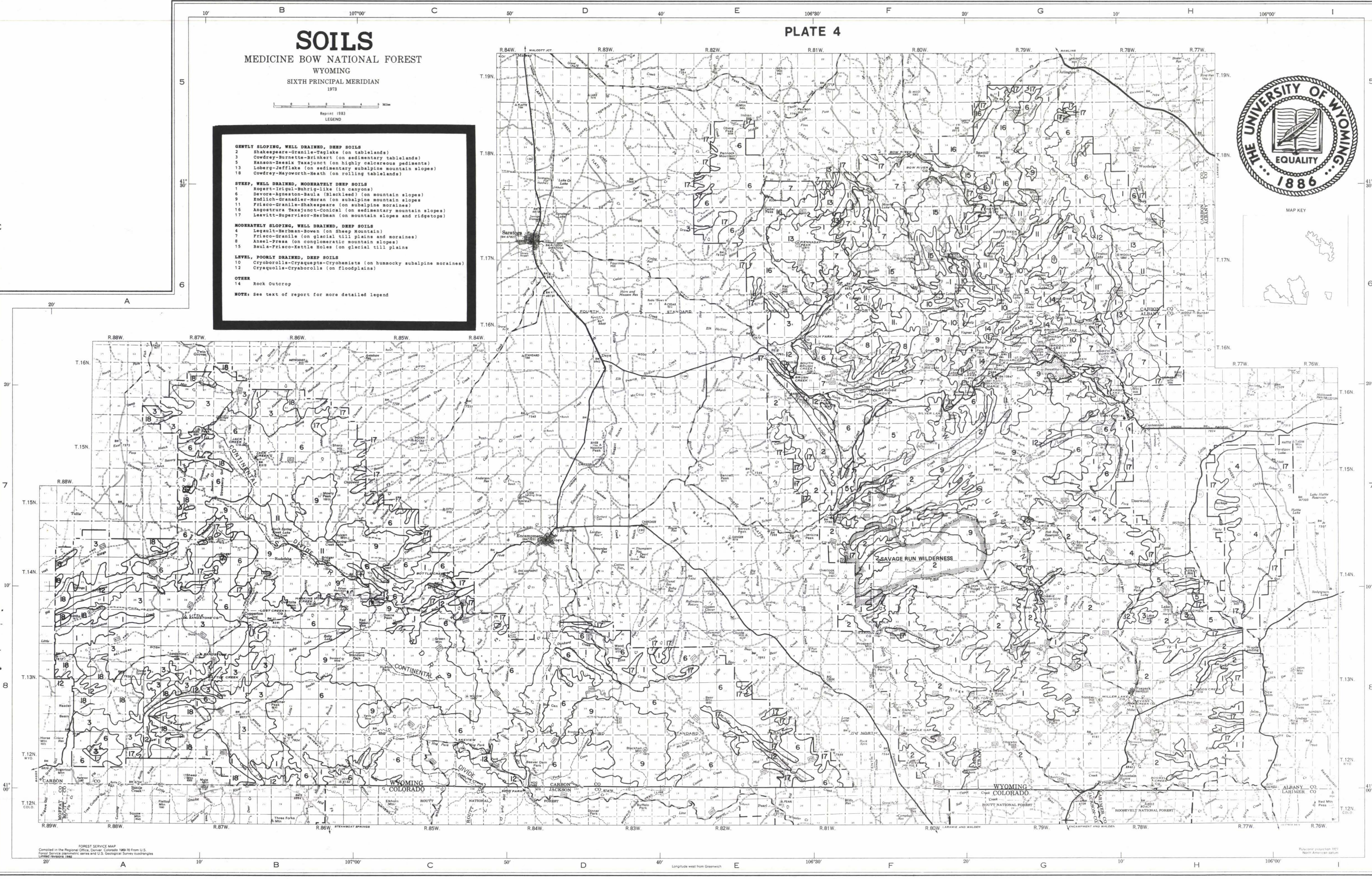
NOTE: See text of report for more detailed legend

PLATE 3



MAP KEY



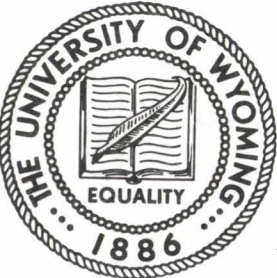


SOILS

MEDICINE BOW NATIONAL FOREST
WYOMING
SIXTH PRINCIPAL MERIDIAN
1973

Reprint 1983
LEGEND

- GENTLY SLOPING, WELL DRAINED, DEEP SOILS**
- 2 Shakespeare-Granite-Teglake (on tablelands)
 - 3 Cowdrey-Burnette-Brinkert (on sedimentary tablelands)
 - 5 Hanson-Seesix Taxajunct (on highly calcareous pediments)
 - 13 Loberg-Jefflake (on sedimentary subalpine mountain slopes)
 - 18 Cowdrey-Mayworth-Heath (on rolling tablelands)
- STEEP, WELL DRAINED, MODERATELY DEEP SOILS**
- 1 Rogest-Isigul-Muhbrig-like (in canyons)
 - 6 Devore-Agnewton-Baula (blacklead) (on mountain slopes)
 - 9 Endlich-Granadier-Moran (on subalpine mountain slopes)
 - 11 Frisco-Granite-Shakespeare (on subalpine moraines)
 - 16 Angostura Taxajunct-Conical (on sedimentary mountain slopes)
 - 17 Leavitt-Supervisor-Herberman (on mountain slopes and ridgetops)
- MODERATELY SLOPING, WELL DRAINED, DEEP SOILS**
- 4 Legault-Herberman-Bowen (on Sheep Mountain)
 - 7 Frisco-Granite (on glacial till plains and moraines)
 - 8 Ansel-Press (on conglomeratic mountain slopes)
 - 15 Baula-Frisco-Kettle Holes (on glacial till plains)
- LEVEL, POORLY DRAINED, DEEP SOILS**
- 10 Cryaborolls-Cryaqueps-Cryohemists (on hummocky subalpine moraines)
 - 12 Cryaborolls-Cryaborolls (on floodplains)
- OTHER**
- 14 Rock Outcrop
- NOTE:** See text of report for more detailed legend



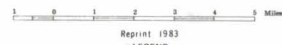
MAP KEY

LITHOMORPHIC UNITS

MEDICINE BOW NATIONAL FOREST

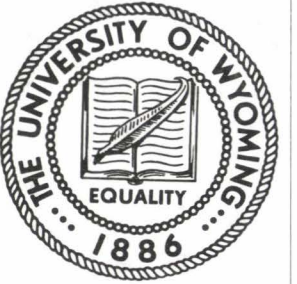
WYOMING

SIXTH PRINCIPAL MERIDIAN
1973

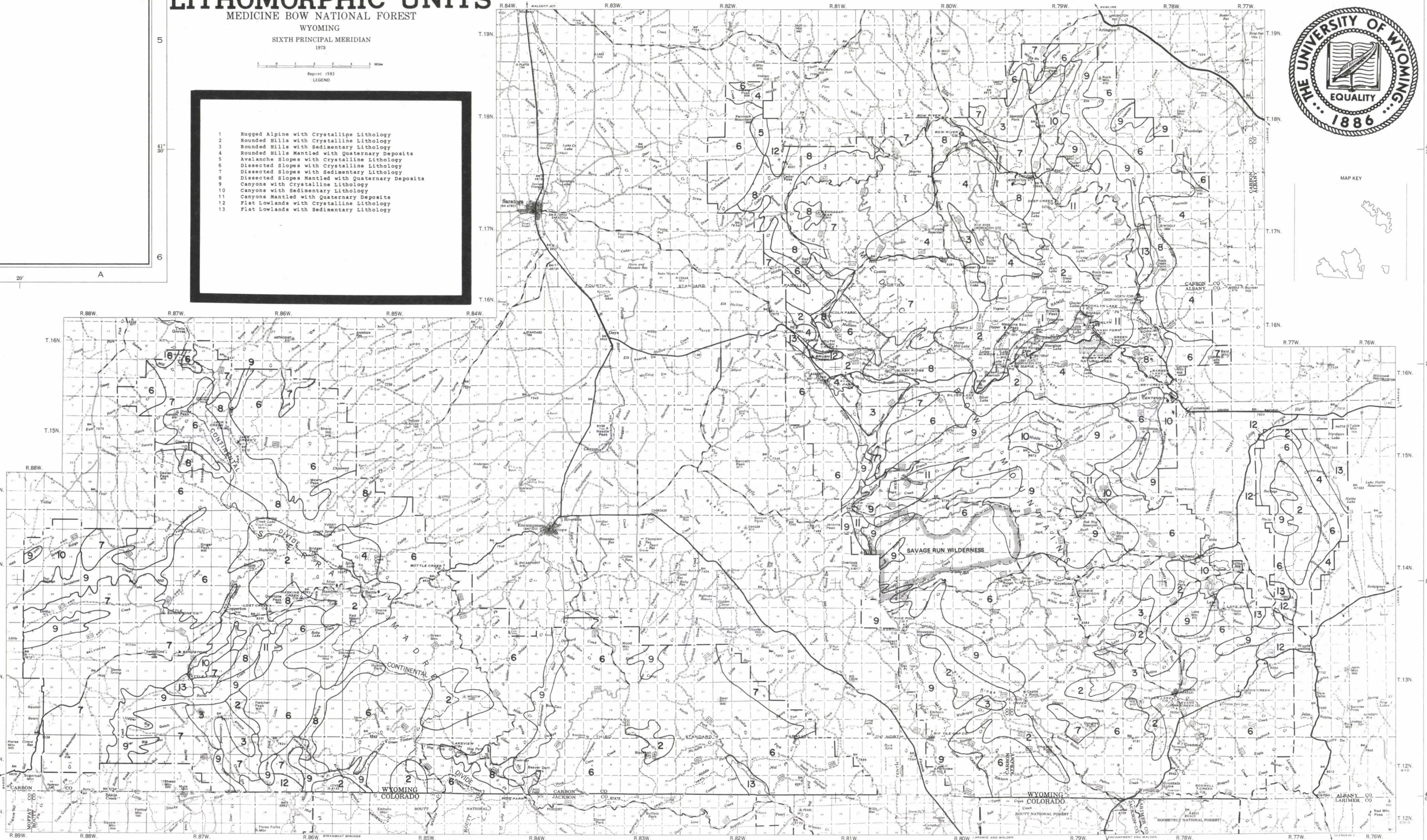


- 1 Rugged Alpine with Crystalline Lithology
- 2 Rounded Hills with Crystalline Lithology
- 3 Rounded Hills with Sedimentary Lithology
- 4 Rounded Hills Mantled with Quaternary Deposits
- 5 Avalanche Slopes with Crystalline Lithology
- 6 Dissected Slopes with Crystalline Lithology
- 7 Dissected Slopes with Sedimentary Lithology
- 8 Dissected Slopes Mantled with Quaternary Deposits
- 9 Canyons with Crystalline Lithology
- 10 Canyons with Sedimentary Lithology
- 11 Canyons Mantled with Quaternary Deposits
- 12 Flat Lowlands with Crystalline Lithology
- 13 Flat Lowlands with Sedimentary Lithology

PLATE 5



MAP KEY



TERRESTRIAL ECOSYSTEMS

MEDICINE BOW NATIONAL FOREST

WYOMING

SIXTH PRINCIPAL MERIDIAN

1973

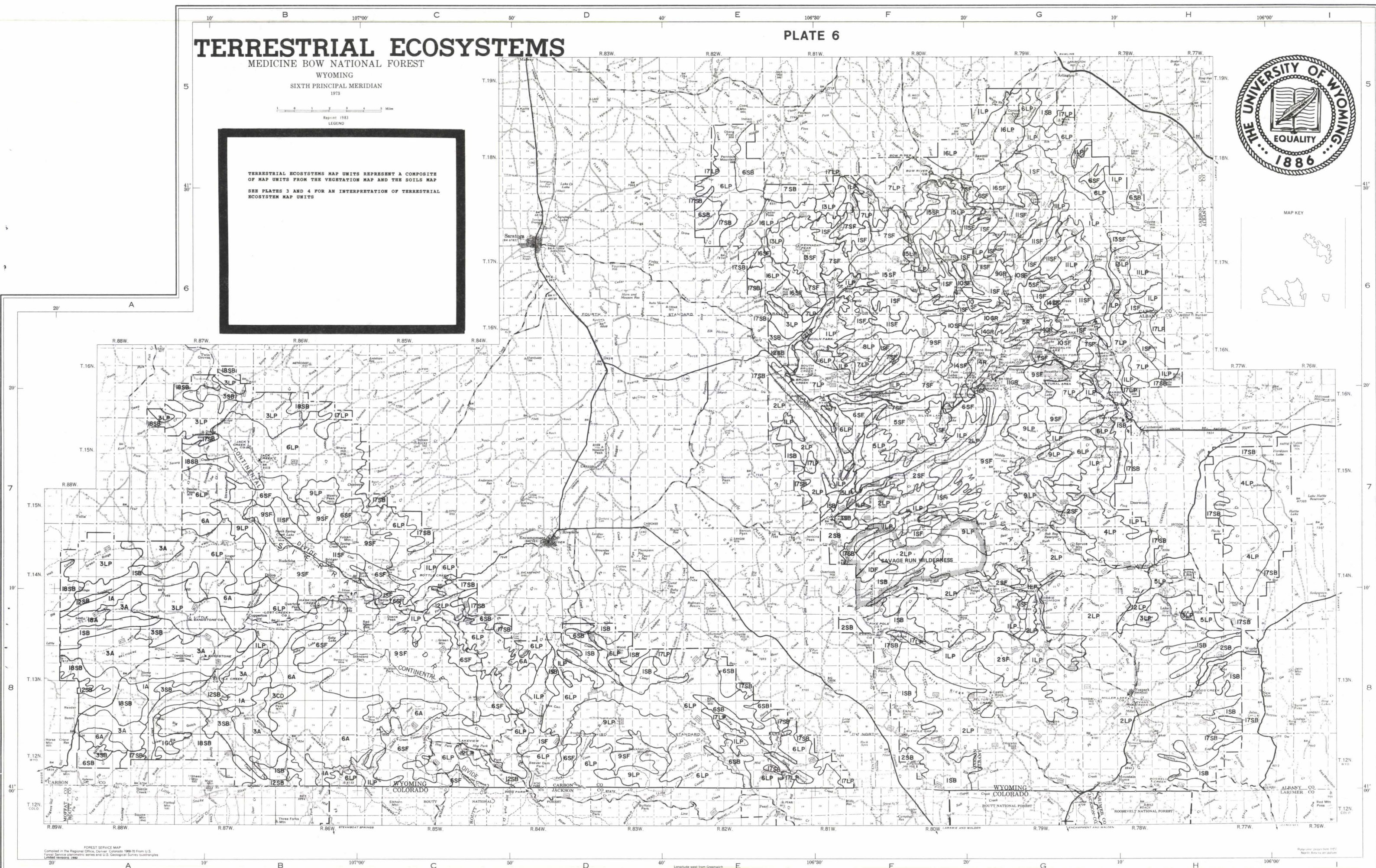
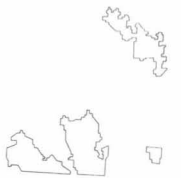


TERRESTRIAL ECOSYSTEMS MAP UNITS REPRESENT A COMPOSITE OF MAP UNITS FROM THE VEGETATION MAP AND THE SOILS MAP
SEE PLATES 3 AND 4 FOR AN INTERPRETATION OF TERRESTRIAL ECOSYSTEM MAP UNITS

PLATE 6



MAP KEY



FOREST SERVICE MAP
Compiled in the Regional Office, Denver, Colorado 1969-70 from U.S.
Forest Service planimetric series and U.S. Geological Survey quadrangles
Updated revision, 1982

Plate 6 of 6
North arrow pointing up

LANDTYPE ASSOCIATIONS

MEDICINE BOW NATIONAL FOREST

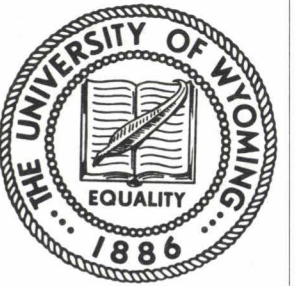
WYOMING

SIXTH PRINCIPAL MERIDIAN
1973

Reprint 1983
LEGEND

- 1 Bare Crystalline High Mountains
- 2 Alpine Quaternary-Mantled High Hills
- 3 Alpine Crystalline High Hills
- 4 Coniferous Crystalline High Hills
- 5 Coniferous Sedimentary High Hills
- 6 Coniferous Quaternary-Mantled High Mountains
- 7 Coniferous Quaternary-Mantled Low Hills (with shallow soils)
- 8 Rangeland Quaternary-Mantled Low Hills
- 9 Coniferous Quaternary-Mantled Hills (with deep soils)
- 10 Rangeland Sedimentary/Quaternary-Mantled Low Mountains
- 11 Coniferous Sedimentary Low Mountains
- 12 Mixed Forest Crystalline Low Mountains
- 13 Coniferous Crystalline Mountains
- 14 Coniferous Sedimentary Mountains
- 15 Mixed Forest Sedimentary Mountains
- 16 Rangeland Sedimentary Mountains
- 17 Mixed Forest Sedimentary Hills
- 18 Mixed Forest Quaternary-Mantled Low Mountains
- 19 Open Coniferous Quaternary-Mantled Low Hills
- 20 Coniferous Crystalline Canyons
- 21 Rangeland Crystalline Canyons
- 22 Open Coniferous Crystalline Flat Lowlands
- 23 Coniferous Sedimentary Flat Lowlands
- 24 Rangeland Quaternary-Mantled Valleys
- 25 Open Deciduous Sedimentary Canyons
- 26 Open Deciduous Sedimentary Low Hills

PLATE 7



MAP KEY

